

**Commonwealth of Kentucky
Division for Air Quality**

PERMIT STATEMENT OF BASIS

FINAL

Conditional Major, Operating

Permit: F-06-010 R1

Owensboro Grain Biodiesel, L.L.C.,

Owensboro, KY

November 6, 2008

Durga Patil, Reviewer

SOURCE I.D. #: 021-059-00211

SOURCE A.I. #: 77459

ACTIVITY #: APE20080001

MINOR PERMIT REVISION - F-06-010 R1:

Owensboro Grain Biodiesel has submitted a revision to the permit F-06-010 involving the addition of hydrochloric acid storage and handling facility as well as citric acid storage and handling facility.

Citric acid used to be stored in tote bins but the quantity was found to be insufficient for plant consumption. Hence it is being upgraded to storage in a 7000 gallon storage tank. A hydrochloric acid storage tank was not listed in the original application and is being added now to the permit. According to the list of insignificant activities produced by the Division for Air Quality (item number 4) all storage vessels containing inorganic aqueous liquids, whose boiling points are above the maximum storage temperature at atmospheric pressure, are categorized as an insignificant activity. The material safety data sheet for hydrochloric acid shows the boiling point ranging from 55⁰C to 94⁰C depending on the acid composition. Under ambient storage conditions, this addition would be categorized as insignificant activity. Citric acid storage vessel of capacity less than 10,567 gallons would again be categorized as insignificant activity as its vapor pressure from material safety data sheet is 0.34 psia, (less than 1.5 psia) and so not subjected to any storage tank design restriction (item 2 in list of insignificant activity). Hence the addition of these two storage tanks and handling of hydrochloric acid and citric acid constitute a minor revision to the permit.

Review of the permit F-06-010 shows certain applicable regulations had been omitted from the permit. Of major consequence is the omission of 40 CFR 60 (Subpart VV), *Standards of performance for equipment leaks of VOC in the SOCMI for which construction, reconstruction or modification commenced after January 5, 1981 and on before November 7, 2006*. It was also noted that the facility was undergoing startup and thus there was no monitoring performed over the past six months. Initial performance testing has since been conducted, however review of the test report showed unacceptable sample recovery percentages during the testing caused by high moisture content in the stack gas and insufficient spiking material in the adsorbent tubes. The facility is scheduled to repeat its performance testing on December 3rd, 2008 and submit the results within 45 days of testing. These test results are crucial in determining the applicability of the modeled emission factor and whether the facility would have a conditional major permit, or apply for a Title V permit within 6 months of submitting the test results.

SOURCE DESCRIPTION - F-06-010:

Owensboro Grain Biodiesel has a permit issued in June 2006 for the construction and operation of a biodiesel plant under 401 KAR 52:030. The plant will have a production unit having a maximum production rate of 42,000 pounds of biodiesel per hour, 5,100 pounds of crude glycerin per hour and 550 pounds of fatty acids per hour. The raw materials used are refined vegetable oil, methanol and sodium methoxide. Other materials used in the process are caustic soda (being stored at the adjacent refinery and then pumped as needed to unit process); hydrochloric acid and citric acid. The uncontrolled emissions of any single HAP is equal to or greater than ten (10) tons per year (tpy) and the combination of HAPs is equal to or greater than twenty-five (25) tons per year. However, the source has requested voluntary permit emission limits of 9 tons per year or less of a single hazardous air pollutant (HAP), and 22.5 tpy or less of the combined HAPs. Therefore, the source is subject to the provision of 401 KAR 52:030.

During the review conducted for the issuance of F-06-010 R1, the Division determined that the facility is subject to NSPS regulations and therefore subject to 40 CFR 60 regulations.

COMMENTS:

Significant emissions

Emissions and the emission units in the original permit consist of vent gases from the methanol storage tanks (3), sodium methoxide-in-methanol storage tank (1), and the biodiesel production unit. The production unit consists of transesterification unit process, glycerin separation unit process, glycerin purification unit process, glycerin concentration unit process and the biodiesel purification unit process and a methanol recovery unit process. The emissions from all the unit processes and the storage tanks listed above constituting the vent gases, made up of methanol and hexane vapor, are ducted to the control system. The control system for the facility consists of a combination of Water-Cooled Vent Gas Condenser, Water/Glycol Vent Gas Chiller and Packed Bed Soybean Oil Scrubber, in series, and will be operated with an overall system control efficiency of 99.2% for methanol and 81.4 % for commercial hexane.

Pollutant	Total Potential to Emit from tanks and biodiesel production unit (tons/year)*	
	before controls	after controls
Methanol	1111.85	11.89
Hexane	27.11	5.04
Total HAPs = Total VOCs	1138.96	16.94

*EF obtained from engineering estimates and computer modeling of the vent gas recovery system

a) Applicable Regulations

- i. 401 KAR 63:020, *Potentially hazardous matter or toxic substances.*

The biodiesel production unit is subject to the 401 KAR 63:020. The requirements of this rule are as follows:

Control of Potentially Hazardous Matter and Toxic Substances: Persons responsible for a source from which hazardous matter or toxic substances may be emitted shall provide the utmost care and consideration, in the handling of these materials, to the potentially harmful effects of the emissions resulting from such activities. No owner or operator shall allow any affected facility to emit potentially hazardous matter or toxic substances in such quantities or duration as to be harmful to the health and welfare of humans, animals and plants.

- ii. 401 KAR 60:005, Section 3, incorporating by reference 40 CFR 60.110b to 60.117b (Subpart Kb), *Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced after July 23, 1984.*

Since the three (3) 180,000 gallon methanol storage tanks have a design capacity greater than 151 m³ (39,890 gallons) containing a stored VOL with a maximum true vapor pressure equal to or greater than 5.2 kPa and less than 76.6 kPa, the permittee is subject to VOC emission control requirements of 40 CFR 60.112b. Pursuant to the proposed design of this plant and these storage tanks, the permittee shall comply with the standard for volatile organic compounds (VOC), 40 CFR 60.112b(a)(3), as follows:

The permittee shall equip each of the three (3) 180,000 gallon methanol storage tanks with a closed vent system and control device meeting the following specifications:

- a. The closed vent system shall be designed to collect all VOC vapors and gases discharged from the storage vessel and operated with no detectable emissions as indicated by an instrument reading of less than 500 ppm above background and visual inspections, as determined in part 60, subpart VV, 40 CFR 60.485(b).
 - b. The control device shall be designed and operated to reduce inlet VOC emissions by 95 percent or greater.
- iii. 40 CFR 60 (Subpart VV), *Standards of performance for equipment leaks of VOC in the SOCMI for which construction, reconstruction or modification commenced after January 5, 1981 and on or before November 7, 2006*, applicable to the biodiesel plant.

The source commenced construction on July 10, 2006. The major raw materials for the source are soybean oil, methanol, sodium methoxide in methanol (catalyst), and the major products are glycerin and biodiesel with most of the methanol being regenerated which is then recycled at the raw material end. Based on the definition of process unit, the entire biodiesel production unit is considered to be a process unit. The facility applied for exemption from applicability of the regulation based on 40 CFR 60.480 (d) proving that glycerol (SOCMI product) is a heavy liquid that is produced from soybean oil (another heavy liquid) only. Methanol was not considered as a raw material since it is regenerated during the process. However, the Division believes that the process requires both soybean oil (a heavy liquid) and methanol (not a heavy liquid) as raw materials for biodiesel manufacture. Hence the source is subject to 40 CFR 60 (Subpart VV) which would require that the facility implement a Leak Detection and Repair (LDAR) program for all equipment in VOC service.

- iv. 40 CFR 60 (Subpart NNN) *Standards of Performance for Volatile Organic Compound (VOC) Emissions From Synthetic Organic Chemical Manufacturing Industry (SOCMI) Distillation Operations*, applies to biodiesel production unit.

The facility shall reduce emissions of total organic compounds (TOC) less methane and ethane by 98 weight percent or to a TOC (less methane and ethane) concentration of 20 ppmv whichever is less stringent. Performance testing results will be used to determine compliance with the requirement. The results of the performance testing will be kept up to date and readily accessible.

- v. 40 CFR 60 (Subpart RRR) *Standards of Performance for Volatile Organic Compound Emissions from Synthetic Organic Chemical Manufacturing Industry (SOCMI) Reactor Processes*, applies to the biodiesel production unit.

The facility will provide grounds for exemption from the provisions of paragraph (a) of 60:700 by operating with a total concentration of TOC (less methane and ethane) in the vent stream less than 300 ppmv (as measured by method 18) or less than 150 ppmv (as measured by method 25A) via performance testing results.

These requirements, and the related testing, reporting, record keeping, and monitoring requirements are incorporated into the permit.

b) Non Applicable Regulations

- i. This source has requested voluntary permit emission limits of 9 tons per year (tpy) or less of a single hazardous air pollutant (HAP), and 22.5 tpy of less of combined HAPs. As such, this source will not be a major source of HAP emissions, and there are no *NESHAPs* (40 CFR 63 and 401 KAR 63) applicable to this area source for HAP emissions, as such is defined at 40 CFR 63.2.
- ii. The one (1) 18,000 gallon storage tank used for storage of sodium methoxide in a solution of methanol is less than 75 m³ and it is not subject to 40 CFR 60, Subpart Kb. The tanks listed as insignificant activities having capacities at or greater than 151 m³ are not subject to 40 CFR 60, Subpart Kb because the stored liquids have a maximum vapor pressure less than 3.5 kPa, and vegetable oil is not a VOL.
- iii. Pursuant to 401 KAR 59:050, *New Storage Vessels for Petroleum Liquids*, this rule applies to each storage vessel for petroleum liquids with a storage capacity of greater than 2,195 liters (580 gallons) and less than 151,400 litres (40,000 gallons) that commenced after the classification date of April 9, 1972 and prior to July 24, 1984, and to each affected facility with a storage capacity less than 40,000 liters (10,567 gallons) that commenced on or after July 24, 1984, which is located in a county or portion of a county designated ozone nonattainment under 401 KAR 51:101, except marginal nonattainment or in any other county and is a part of a major source of volatile organic compounds. The facility is not major for VOC.
- iv. 40 CFR 60, Subpart VVa, Standards of Performance for Equipment Leaks of VOC in

the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006 is not applicable since the facility commenced construction before the applicability date and the modification will not incur capital expenditure.

Insignificant Activities

i. One (1) 54,000 Gallon Soybean Oil Feedstock Tank	None
ii. Three (3) 54,000 Gallon Biodiesel Tanks	None
iii. Two (2) 455,000 Gallon Biodiesel Tanks	None
iv. Two (2) 13,000 Gallon Glycerine Tanks	None
v. One (1) 455,000 Gallon Glycerine Tank	None
vi. One (1) 13,000 Gallon Fatty Acid Tank	None
vii. One (1) Hydrochloric acid storage tank of 9500 gallon capacity and handling	401 KAR 63:020
viii. One (1) Citric acid storage tank of 7000 gallon capacity and handling	401 KAR 63:010
ix Haul roads – paved and unpaved	401 KAR 63:010

EMISSION AND OPERATING CAPS DESCRIPTION:

Owensboro Grain Biodiesel has requested voluntary permit emission limits of 9 tons per year (tpy) or less of a single hazardous air pollutant (HAP) and 22.5 tpy or less of combined HAPs. Compliance with these limitations shall also limit total volatile organic compound (VOC) emissions from the source to 90 tpy or less. Compliance with these permit limits shall make the requirements of 401 KAR 52:020, Title V permits, not applicable to this source. Compliance with these limits shall also make the requirements of 40 CFR Part 63 for major sources of HAP emissions, as incorporated by reference at 401 KAR 63:002, not applicable to this source.

PERIODIC MONITORING:

Testing will be done to determine compliance with HAP emissions for source wide limitations and overall HAP removal efficiency of 98.5% with removal efficiency of 99.2% for methanol and 81.4 % for commercial hexane. HAP emissions in tons shall be calculated at the end of each month, and consecutive 12 month total of individual and combined HAP emissions for each month ending in the semi annual period shall be reported and the records maintained on site.

The emissions testing for HAP removal efficiency will be repeated at least once every five years from the date of the previous test.

Preventive maintenance records for the condenser; chiller and scrubber will be maintained and produced to the Division upon request. A log of the results of the semiannual inspections performed on the condenser, chiller and scrubber will also be maintained on site.

The following parameters will be continuously monitored –

- i. vent gas flow rate;
- ii. coolant liquid flow rate through the condenser and chiller;
- iii. inlet and coolant temperature at the condenser and chiller;
- iv. refined soybean oil flow rate to the scrubber;
- v. pressure drop across the scrubber;
- vi. calendar month records of the usage of refined vegetable oil, methanol and sodium methoxide in methanol and any other HAP containing material along with their invoices.
- vii. calendar month log of operating hours and amount of raw material used and amount of biodiesel produced including purchase invoices.
- viii. all monitoring for equipment leaks from valves, flanges and pump seals.

OPERATIONAL FLEXIBILITY:

None

CREDIBLE EVIDENCE:

This permit contains provisions which require that specific test methods, monitoring or recordkeeping be used as a demonstration of compliance with permit limits. On February 24, 1997, the U.S. EPA promulgated revisions to the following federal regulations: 40 CFR Part 51, Sec. 51.212; 40 CFR Part 52, Sec. 52.12; 40 CFR Part 52, Sec. 52.30; 40 CFR Part 60, Sec. 60.11 and 40 CFR Part 61, Sec. 61.12, that allow the use of credible evidence to establish compliance with applicable requirements. At the issuance of this permit, Kentucky has only adopted the provisions of 40 CFR Part 60, Sec. 60.11 and 40 CFR Part 61, Sec. 61.12 into its air quality regulations.